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Working Paper Series

#2010-013

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UNU-MERIT Working Papers
ISSN 1871-9872

Maastricht Economic and social Research and training centre on Innovation and Technology, UNU-MERIT

UNU-MERIT Working Papers intend to disseminate preliminary results of research carried out at the Centre to stimulate discussion on the issues raised.

Occupation choice: Family, Social and Market influences*

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March 10, 2010

Abstract

The advance of knowledge-based societies has modified the labor markets and qualification requirements. In this sense, and considering that individual choices about careers and occupations have pervasive social effects, there is a growing interest from both academics and policy makers in understanding and influencing the process of education choice. Specifically, there is a worldwide renewed concern on achieving higher levels of graduation from scientific and technological disciplines. Available evidence shows that mobilizing individual wills towards these highly priority careers is not an easy nor mechanical task. Thus, it is necessary to expand the standard view about the process of occupation choice by adding non pecuniary factors, influence of social networks and the role of information and guidance policies. With these objectives in mind, and after reviewing the theoretical literature about occupation choice in economics, the present paper analyzes the effects that diverse personal, family, social and economic aspects have in the selection of an university career. Based on the empirical findings, some policy recommendations are put forward.

JEL codes: J44, J48, J24, I21.
Keywords: Occupational Choice, Professions, Public Policy.

*This paper is a modified version of a chapter originally published in G. Riquelme (ed.) (2009). I am indebted with Graciela Riquelme for granting me access to the data used here. Marta Novick, Mariana García and Gabriel Yoguel provided useful comments. Mariana González assist me with the Argentinean Household Survey (EPH). Robin Cowan was a permanent source of ideas and advice. All mistakes remain mine. tacsir@merit.unu.edu

> Our remote ancestors did not expand their economies much by simply doing more of what they had already been doing [...]. They expanded their economies by adding new kinds of work. So do we. *Jane Jacobs, "The economy of cities".*

1 Introduction

The current times have produced a basic agreement between policy makers, analysts and the population in general around the globe: a strong endowment of highly skilled human resources is a prerequisite for achieving a sustained development path. Thus, both developed and developing countries have proposed to reach higher levels of education, in general, and, more specifically, to attain a bigger proportion of their higher education graduates in those disciplines related with basic and natural sciences, engineering and technology.

Specifically, the advance of knowledge-based societies has modified labor markets and qualification requirements. At the same time, individual choices have longstanding social effects and are fundamental determinants of the possibilities for growth and development. Inefficiencies and unequal access to information and guidance provide a rationale for public policies aiming at orienting a significant portion of the students towards the required profiles.

Evidence shows that many developing countries present a highly concentrated distribution of people in certain university disciplines. Curiously, the less preferred disciplines are typically those that are expected not only to have the higher *social* returns in the long run, but also have both relative higher wages and higher demand. This evidence is frequently documented in reports, recommendations and policy objectives.

This description is not new for the specific case of Argentina, our focus in this study. Different technical reports and analysis have highlighted the lack of professionals in several branches of engineering and other technical profiles during the Industrialization by Import Substitution (ISI) period.[1] These shortages, many times expressed in highly alarmist tones, implying reckoning that there was, in fact, an excess demand for these professional profiles. From this seems reasonable to infer that the wages for these professionals would have been higher than for other university graduates. However, and demolishing the pretension that expected income and expectations about the future state for the labor market are the only forces dictating the occupation choice, youngsters simply choose not to enroll in these disciplines.

A plausible explanation could be the generally imperfect state of markets and information in developing countries. More difficult to understand is the fact that many highly able individuals decide to follow (relatively) low paid occupations in developed countries (Humlum et al., 2007).[2] If we assume that markets and

[1] As an example, López (2006) is abundant in references about this situation at different moments in the country's history.

[2] Reports such as U.S. Department of Education (2006), U.S. National Science Board (2004) and RAND Corporation (2004) are recent examples about the situations and concern in the

information work relatively well in developed countries, looking beyond markets to non-pecuniary factors may be fruitful when policies are designed.

Even when issues related to the education endowment and educational characteristics of the population have been central concerns in economics, recent decades have seen a rebirth of interest in the topic, broadening its analysis and empirical coverage. At the same time, contributions in other segments of the discipline have highlighted the role played by non-pecuniary factors, social aspects and networks have on individual decisions. Nevertheless, those works oriented towards explaining individual decisions in education have paid little attention to these strands of literature, keeping the main theoretical foundation focused primarily on pecuniary factors in a context of rational decision with globally available and perfect information.

Thus, this paper will show, first, the need to include several personal, family and social dimensions into the analysis in order to fully understand the choice of a university career. To do this, the first section is centered around a review of the theoretical contributions in economics (especially at a microeconomic level), suggesting aspects that deserve to be explored and taken into account when designing policies. After presenting the current situation in Argentina, by using information from the Advanced University Students Survey (PICT Redes 00013) the following sections explore the empirical relevance of the proposed dimensions. The results highlight the growing importance of publicly providing precise information and counseling about the available options. Finally, conclusions and policy recommendations are provided.

2 Education in economics: Macro concerns, micro decisions

The voluminous literature on education in economics includes theoretical contributions, empirical analysis and policy recommendations.[3] Beyond the specificities of their methods, the received literature can be classified into two broad groups. While the first group focuses on the aggregate effects of education, the second is concerned with the microeconomic foundations of the decisions related to education and their implications in terms of individual trajectories and income.

Within the group dealing with the "macro" effects of education, it is possible to distinguish different strands: contributions dealing with the relation between education and growth, others concerned with the effects of education on competitiveness and, finally, those concerned with the implications for the development process. Despite the fact that these strands differ in their ultimate

US. European Commission (2004) is nowadays a classic example for Europe.

[3]To achieve a complete review of this vast body of knowledge would be an impossible task and would certainly exceed the intentions of this paper. For this reason, many times we will refer to specific strands of literature in a general way. For a more detailed account, the reader is suggested to consult Checchi (2006), Morduchowicz (2004) and Baudelot and Leclerc (2005).

concern (growth, competitiveness, development), all of them consider education as a fundamental input of the process under study. More fundamental for our goals, however, is that none of these strands develop a characterization of the process of individual decision-making different from the one offered by the standard microeconomic framework (to be presented below) where the pecuniary dimension is the fundamental variable for both the analysis and the policy formulation.

Since the arrival of the theories of endogenous growth (Romer, 1986; Lucas, 1988; Aghion and Howitt, 1992), research on economic growth has re-acquired a fundamental importance in economics. In this literature, the level of education of the population (referred to as human capital) is considered to be a productive input in the production function and relates its level with the levels of per capita income. Generally speaking, the endogenous growth theories admit the potential existence of externalities, these being expressed as a divergence in individual and social rates of return of the investments in education.[4]

A second group of contributions (Fajnzylber, 1988; Chesnais, 1991, among others) have focused on the positive effects that the accumulation of education (measured in years of study, mainly) has on the competitiveness of either firms, regions and countries.[5] A great portion of this literature has approached policy domains by showing how the relative shortage of certain technological profiles is something worthy of concern and should be addressed with urgency. In this sense, the previously mentioned studies for both the US and EU present, on many occasions, a dramatic and even apocalyptic tone. No matter the level of drama employed, in none of them is the fundamental premise of individual behaviour discussed. There again, it is assumed that individuals react to monetary incentives requiring to provide financial means to facilitate their access and permanence.

Finally, in the field of development economics the call for a growing proportion of certain professional profiles arises from understanding development as a complex process of structural change characterized by the coevolution of the economical, cultural, institutional and technological spheres (Kusnetz, 1966; Denison, 1967; Saviotti and Gaffard, 2004; Katz, 2006). Even when in this literature the interaction between the pecuniary aspects and social norms and institutions are believed to act as both catalyzers and inhibitors of development, there is no specific mention of how these latter dimensions influence and/or condition the process of career choice.

Basically, occupational choice is explained by a fully informed rational decision about wages. Individuals select occupations after assessing the future state of the labour market, all the relevant information being fully revealed by wages and employment rates. In this sense, any observed dearth of interest in certain professions or occupations simply reflects the lack of employment opportunities

[4] See Barro and Sala-i-Martin (1995) and Aghion and Howitt (1998) for a review of endogenous growth theories. Barro and Lee (1994) and Krueger and Lindahl (2001) highlight the role of human capital on economic growth.

[5] Bianco (2007) reviews the different existent notions of competitiveness.

or lower wages with respect to other options.[6]

2.1 Human capital theory

The basic principle of the human capital theory (Schultz, 1961; Becker, 1964) is that individuals should invest in education as long as the marginal benefits associated with this investment are higher than its marginal costs. Analysis of this elegant and simple statement stands on two pillars. First, that all the relevant information is being fully revealed by wages. Second, despite the fact that there are is no specific mention of the way that expectations about the future state of the labor market are formed, expectations are assumed to be unbiased and efficient (Borghans et al., 1996).[7] The influence of human capital theory led to an almost complete absence of studies focused on "what to study" centering its attention on "how much to study". Existing exceptions did not represent a strong criticism of the received literature, mostly studying particular professions in the light of the information about wages (see the contributions of R. Freeman). Thus, they sustain the view that students opt for one discipline because of their income expectations.

Generally speaking, economics has ignored the role and implications of choosing different occupations.[8] The sociological literature focused on social and intergenerational inequality has done a better job. Specifically, it considers that different fields of study confer specific resources (cultural, economic, communicational and technical) to the individuals, affecting their available opportunities

[6]Different from the mainstream in economics, in several disciplines —among which sociology and psychology stand out– the occupation choice can not be explained by only taking into account pecuniary rewards. For instance, psychology has centered its analysis on the influence of non-pecuniary aspects. In this sense, we find a wide array of factors other than money as the fundamental dimensions, including a strand that highlights personal, physical and personality traits (Holland, 1997; Prediger, 1998), other focuses on the intellectual ability, special talents, motor coordination and cognitive processes (Lent et al., 1994), a third group orients towards unveiling the influence of social values (Heppner et al., 1996) and, finally, some literature aims at revealing the effect of family ties (Fauad, 1994). Relatedly, sociological research on educational inequality rests on the belief that children of different classes and origins have different perceptions of the costs and benefits associated with specific educational choices (van de Werfhorst, 2002). When choosing, individuals are influenced by the probability of success, the costs of failure and their idiosyncratic resources and costs. All these factors are individual-specific and depend on family background and the transfer of specific social capital endowment for the child (see, for example, Bourdieu and Passeron, 1964). According to these disciplines, those interventions centered only on manipulating the monetary rewards are doomed to fail.

[7]Different contributions like those by Betts (1996), Manski (1993), Dominitz and Manski (1996 and 1997), Smith and Powell (1990) and Webbink and Hartog (2001) are focused on assessing the predictive capacity that young individuals have about their future income levels. Three main conclusions can be drawn from this research. First, individuals tend to overestimate the income of the occupation they have chosen. Secondly, minorities, women and individuals from lower income households are more inclined to underestimate their future income in comparison with other individuals. Finally, more advanced students make better predictions than rookies because of a better knowledge about market requirements, their own abilities and potential.

[8]The literature on intergenerational transmission of occupation is an exception in this respect. See Chevalier (2001) for a review.

as well as their aspirations and expected benefits. In this perspective, the previous generations' achievements (both in terms of education level and field of specialization) influence the type and quality of the available information. This, in turn, affects the perceptions about costs and benefits for each of the disciplines. (Weerfhorst et al., 2001).

2.2 Omitted aspects

The previous sections briefly sketched the way that occupation choice is generally approached in economics. The following segments present a variety of other motivations and considerations which, despite being used in other realms of the profession, have not yet been embedded in the "choice microeconomics". We believe that their inclusion will produce a more robust framework and more effective policy recommendations.

Status and reputation There is a long tradition in economics that considers the desire to "create a good impression" as part of the motivations behind an individual's actions and behaviour. This legacy started with Smith's (1776) statement that social mechanisms of compensation — such as admiration — influence behaviour. Veblen (1899) was more explicit, arguing that an individual undertakes costly investments, through conspicuous consumption, to demonstrate that he or she is worthy of approbation. A modern approach is found in Frank (1985) for example, who argues that an agent's utility depends on his or her relative ranking in some distribution of attributes, and he or she will undertake actions to try to change this ranking. This is supported by empirical research in psychology on the importance of relative position in well-being, life satisfaction and happiness (Easterlin, 1974; Frey and Stutzer, 2002). In the same vein, being a member of a socially well-considered group enhances individual self-esteem (Deaux, 1996).

The status concern has also been used to explain behaviours otherwise considered irrational: contributions to public goods (Gann, 2001); altruism (Glazer and Konrad, 1996); or the choice of higher than optimal levels of education (Fershtman and Weiss, 1993).

Social rewards: approval Most people devote significant effort and activity to being accepted by others (Mailath and Postlewaite, 2003). Generally, humans get utility from social approbation. In this sense, the ideas that others build about our intelligence, talent, merit and attributes can have significant influence on our decisions and investments. Thus, the way certain activities affect others' opinions will influence the utility associated with these activities (Glazer and Konrad, 1996), and thus the behaviour of a utility-maximizing agent.

Societies often grant approbation to individuals who are believed to have some relevant but scarce attribute. Which attribute is considered relevant — parentage, occupation, consumption income, talent, and so on — is specific to each society at each point in time. Any existing incentive scheme will give little

(or no) value to some assets and positive value to others. Thus, it becomes fundamental to understand the quest for social approval as a source of non pecuniary rewards.[9]

Specifically, we take as our starting point that each occupation receives together with its monetary reward some "social reward",[10] and it is this combination of both pecuniary and non-pecuniary rewards that explains the choices made by individuals.[11] At the same time, the social rewards incentive is endogenously determined, where history influences future decisions, potentially producing traps and vicious (virtuous) circles.

Intergenerational transmission of values Marshall believed that by observation and transfers the sons of current producers were the perfect apprentices.[12] In a certain way, it was traditionally expected that the younger generations would continue the family business or follow their parents' footsteps. Although less widespread than before, this legacy is still present in certain specific professions, such as politics, arts, agriculture, medicine and law, and strong in certain regions of the world.[13] Several explanations of this phenomenon have been proposed. First, it can simply be driven by nepotism in which the parents can use their insider-position for acquiring advantages or privileges for their children (Laband and Lentz, 1983). Second, children can benefit from an intergenerational transmission of abilities and expertise (Becker and Tomes, 1986). Third, in the case where a profession requires important setup costs, following the parental occupation implies reduced costs and rent transfers —as in the case of name-brand loyalty from customers or clients (For a review, see Chevalier, 2001).

[9] From an economic point of view, such an incentive scheme present worth mentioning characteristics. First, activities performed and individuals' decisions are affected by other's opinions and are not result as the decision of an isolated agent. Second, social rewards is a cheaper incentive than private rewards (i.e., wages) or the rule of law (i.e., norms and punishments). Specifically, when some individual is rewarded socially we are not extracting resources from those granting the approval. However, the identification of those individuals worthy of approval might be costly and many times socially inefficient by inducing competition about individuals. Many times, individuals will devote efforts and resources to send a "signal" to others (see Veblen and Spence).

[10] We can imagine that each occupation will occupy different positions in the pecuniary and social rankings. In this respect, contributions such as van der Klaauw (1989), Baumol (1990), Murphy et al. (1991) and Acemoglu (1995) tend to characterize the tension between these orderings in the framework of two different activities, namely those productive and those rent-seeking.

[11] Here, is possible to understand why economics has preferred generally to omit social rewards. Firstly, statistical offices do not compile series about the evolution of reputation for different occupations, while in many countries they do follow their wages evolution. Unfortunately, Argentina is not among this group of countries. Secondly, "mixing" both types of rewards requires to have some idea about the individual preferences.

[12] "[A]lmost the only perfect apprenticeships of modern times are those of sons of manufacturers, who practice almost every important operation that is carried out in the works sufficiently to be able in after years to enter into the difficulties of all their employees and form a judgement on their work." (Marshall 1920, 248)

[13] For specific examples see Lentz and Laband (1987 and 1990) and Laband and Lentz (1992).

Hence, different parental background in terms of occupation endow younger agents with distinctive information and expectations about their future career options. Relatedly, sociological research on educational inequality rests on the belief that children of different classes and origins have different perceptions of the costs and benefits associated with specific educational choices (van de Werfhorst, 2002). When choosing, individuals take into account their probability of success, the costs of failure and their idiosyncratic resources and costs. It should be stressed that all these factors are individual-specific and depend on family background and the transfer of specific social capital endowment for the child (see, for example, Bourdieu and Passeron, 1964).

Another alternative to disentangle the intergeneration effects is based on the transmission of values from one generation to the other (Bisin and Verdier, 2000 and 2001). Thus, Corneo and Jeanne (2007) propose a framework where parents transfer to their offspring symbolic values that include a specific ordering of the different occupations.

At this point we see that different mechanisms are proposed to explain intergenerational inertia in occupation choice, namely via transfer of relevant assets, skills or values from parents.

Identity Individuals think of themselves in terms of social categories. Thus, in addition to monetary rewards, individuals obtain different degrees of satisfaction depending on how their actions are related to those prescribed by the category they belong to. In this sense, different empirical studies show that feeling part of specific social categories conditions individuals' performance: the self-identification with one category induce behaviours oriented towards conforming with the existing stereotype(see Hoff and Pandey, 2006).[14] In relation to occupation choice, Humlum and others (2007), taking the ideas of Akerlof and Kranton (2000), find that identity does, under certain circumstances, affect both the quantity of education and the field of specialization.

For these authors, public policy should not be concerned only with providing financial incentives but should also attend to identity related aspects. In this sense, they recommend to implement information campaigns that will show who are "fit" for certain schools and careers. Initiatives such as the "Occupational Outlook Handbook" by the BLS for the US, the ONISEP in the French case or the occupation observatory by ROA-Maastricht University can be considered examples in this direction.

Social Networks Recent years have seen the emergence of a considerable interest in the way that social interactions and social norms and structures condition individual behavior. In a parallel path, the literature dealing with job search has moved towards a framework that attempts to abandon the exclusive focus put on individuals making decisions on a one-to-one basis (Ioannides and

[14]Steele and Ambady (2007) and Benjamin et al. (2007) analyzed female performance on maths exams and black individuals on intelligence tests.

Loury, 2004). Evidence indicates that access to information is heavily influenced by social structure and that individuals use connections with others to build and maintain information networks. Diverse empirical studies report that approximately 50% of employed workers found their jobs through social networks although, in general, this proportion varies with sex, occupations, skills and socioeconomic background (Lavezzi and Meccheri, 2004).

The importance of social networks in the labor markets is a well known in the sociological literature (e.g. Granovetter, 1974 and 1995). Different authors have highlighted the importance of social links such as friends, relatives and acquaintances, as sources of information on jobs. Since the work of Rees (1966), who first drew attention to differences among workers in their use of the variety of available information outlets, economists acknowledged that labor markets are different in the way that demand and supply match.

Two recent papers by Calvó-Armengol and Jackson (2004 and 2007) became the cornerstone of the economic literature on networks on the job market. These contributions explore the implications of exogenous information networks and provide explanations for several important stylized facts about labor markets such as the probability and duration on unemployment spells and influence of connections on higher wages.

Nevertheless, some further precisions are needed to bring these models closer to the empirical evidence. Here, the discipline has witnessed controversies about the effect on wages, efficiency and types of occupations that the jobs acquired through social network present. The general conclusion arising from the leading contributions such as Bentolilla et al., (2004), Cahuc and Fontaine (2002), Fontaine (2005 and 2006) is the need for distinguishing types of contacts involved. This distinction reflects that different types of individuals will transmit different messages about the job market: different contacts will provide different information and will influence individuals to pursue, eventually, different careers. Then, social networks might tempt individuals to forfeit their "ideal" career because of the ease of finding a job in an alternative discipline.

Of specific interest to us, Calvó-Armengol and Jackson (2008) find that the existing intergenerational correlations in occupations might be obscuring the influence played by an important number of "neighbours" that when confronted with the same problem, decide alike. Thus, it becomes fundamental to understand whether there are "threshold effects" that might be in place or not in relation to the occupation choice.

Concluding, the literature on social networks shows us that the position that the agents have together with the types of links that they form (and maintain) affect their labour market outcome and potentially condition their future options and decisions. Information, being transmitted via contacts who are members of a specific network, becomes specific for each individual. Different nodes of a network (i.e., young individuals in our case) will have both different future perceptions and options about their future careers.

Having reviewed different strands generally omitted by the economics of occupation choice, we will focus our attention on the case of Argentina. There we can see that only a few careers account for the majority of the new university en-

rollments. Fields related with scientific and technological fields (like engineering and computer sciences) despite their amazing prospects in the labour market (in terms of employability and wages) simply don't attract enough interest from young individuals.

3 The situation in Argentina

According to data from the latest population census (INDEC, 2001), Argentina has a total of 1.14 million university graduates, representing slightly more than 3.1% of its total population and 5% of its population older than 20 years old. If we compare this with other countries, it becomes evident that this proportion is lower than that exhibited in developed countries and even below that of other countries region such as Mexico or Chile. However, both the enrollment levels at higher education institutions in general and specifically in the university system, show a tendency to increase in recent decades. In fact, and again using data from the census, more than one third of those who finished secondary education are enrolled in or have finished university studies. At the same time, the latest information about university enrollment shows that the universities have currently more than 1.5 million students, attaining 18.6% and 47.7% of net and gross enrollment rates in relation to the population of 20 to 24 year olds (University Statistics Yearbook, 2007).

The enrollment figures, then, show that the problem of low enrollment in tertiary education is being attenuated. Focus has shifted, however: the most important concern nowadays is the field of specialization. Here, we can see that only a few careers —medicine, law, architecture, psychology and business administration and economics— account for approximately 60% of the population holding a university degree. At the opposite extreme, those fields that have been systematically considered as of fundamental importance for the country (natural and physical sciences, engineering, computer sciences) account for only 17% of the graduates.

If an important endowment of highly skilled professionals in Science, Technology and Engineering is a prerequisite for development, our concern should have been growing in time. In this respect, the historical evolution for engineering serves as an illustration for Argentina's situation. For example, while in 1960 the graduates in engineering represented a 12% of the total population of university graduates, this proportion being similar to that of Canada at the time, nowadays, the same group of graduates has fallen to 10.5% while in Canada reached 13.1%. At the same time, the proportion of graduates in natural sciences and engineering in relation to the 20 to 24 years old group has been almost unchanged between 1975 and 2000 in Argentina, while countries like Finland have tripled it and Korea have multiplied by five (NSF, 2008).

Again, the data in the latest census provide a strong indication that the orientation of the studies is becoming a bigger problem. Specifically, the younger group of graduates (those between 20 and 29 years old) are even more strongly

biased towards traditional fields, and have the smallest proportion of graduates in engineering and sciences when compared with other age groups. In this sense, disciplines like economics and those related to humanities and social sciences are filling this gap (see Table 3). Specifically, while economics represents a 22.7% for the younger group, it only accounts for 15.6% of those graduates aged 40 years or more. Engineering is the opposite: accounting for less than 6% for the group of young professionals, this specialization represents 13% of the older graduates. This latter group is the one that allows engineering to exhibit, still, a higher share in the total number of university graduates. The share of graduates in Sciences fell by one third between the older and younger groups. Interestingly, Informatics and Computer Sciences shows an important increase in its share in the younger generations. This may partially reflect the creation of schools and degrees specific in the field.

	University graduates by age			
Field of science	Total	20 to 29	30 to 39	40 & older
Economics	16.9	22.7	16.7	15.6
Medicine	16.6	14.2	15.5	17.9
Law	13.6	13.4	14.1	13.5
Humanities and social sciences	12.4	13.5	12.1	12.3
Engineering	10.5	5.7	8.2	13.0
Architecture & Design	6.1	6.8	7.1	5.5
Pharmacy & Biochemistry	3.8	2.9	4.2	3.9
Education	3.5	4.3	4.4	2.9
Dental doctor	3.4	3.6	3.4	3.3
Sciences	3.4	2.5	3.0	3.7
Informatics &computer sciences	3.0	4.8	4.9	1.6
Agronomics	2.7	2.1	2.5	2.9
Veterinary	1.6	1.3	1.6	1.7
Foreign Languages	1.4	1.4	1.4	1.4
Arts	0.9	1.0	0.8	0.9
Total	100.0	100.0	100.0	100.0

Table 1: University graduates by field of science for different age brackets. Source: Author's elaboration using Population Census Data (2001).

With the intention to present this information in a clearer way, we classified the university graduates into two groups: priority and non priority fields. This ordering corresponds with that used by the Federal education authorities who identified specific shortages, and have just created two ambitious scholarship programs (ICT and Bicentenary Scholarships) oriented towards promoting the enrollment and graduation at the university level in sciences, engineering and informatics.[15] With this categorization, we can observe that the proportion of

[15] Additionally, the Ministry of Labour established together with the Software Chamber two programs, IT Generation and Control+F, intended to generate specific skills on the young population that could use in the software firms. It should be noted, nevertheless, that these

graduates in these priority areas in relation to that with university diploma has been steadily decreasing for the younger generations (Table 2). Below, we will show that this results mostly from the lack of students enrolling in these fields.

	University graduates by age (in %)			
Type of career	Total	20 to 29	30 to 39	40 & older
Priority fields	15.7	11.9	15.2	17.1
Non priority fields	84.3	88.1	84.8	82.9
Total	100.0	100.0	100.0	100.0

Table 2: University graduates by type of career for different age brackets. Source: Author's elaboration using Population Census Data (2001).

It is important to mention, and contrary to the suggestions arising from the career choice in economics, this situation can not be explained by a lack of employment opportunities or lower wages relative to other professions. In fact, several studies, (ECLAC, 1958; OECD, 1967; Aráoz, 1969, among others) drew attention to the negative effects of the continuous excess demand for qualified workers, technical personnel and engineers. Equivalently, the recent growth experienced from 2003 onwards, is plagued by references to industry's desperate search for technically trained professionals. Despite the alarmist tone found in many of these documents, these gaps have not been closed or even narrowed. In this sense, López (2006) concludes that this first-hand evidence demolishes the suggestion that the individuals are rejecting these technical careers because a scarcity of employment opportunities. For him, then, the reasons for these situation should be traced to the supply side, specifically to its institutional and cultural determinants (p. 166).

It seems, simply, that the youngsters do not react to or take into account valuable and apparently freely available information coming from the labour market when they have to decide their future. The case of the professionals in informatics and software deserves special attention and will be analyzed in section 3.1.

3.1 Present enrollments and future problems

Judging by current enrollments, the prospects for the future are not very different. The distribution of students and new enrollments is strongly biased against natural sciences, engineering and informatics. While law concentrates more than 13% of the students at public universities and business and economics approach 20%, engineering (6.1%) together with informatics (4.1%) have slightly more students than psychology and communication together. Table 3 presents

programs only provide financial assistance without advancing on issues related with the provision about the information or the social perception about the involved careers. This latest aspect is fundamental since, as Klubitschko (1980) already highlighted for the students of the University of Buenos Aires, the enrollments in those careers perceived as prestigious are higher than those perceived differently, even after controlling by the social origin of the students.

information about new enrollments, students and graduates at the university level.

Careers	New enrollments (% of total)	Students (% of total)	Graduates (% of total)
B.Adm. & Economics	17.3	19.7	17.1
Medicine	10.9	5.2	8.5
Law	10.2	13.1	14.3
Engineering	6.4	6.1	5.8
Architecture and Design	5.4	6.0	5.7
Informatics	4.9	4.3	2.2
Psychology	4.8	4.6	4.8
Communication	3.8	3.8	2.8
Sociology	3.5	3.2	3.2
Sciences	3.2	2.9	2.2

Table 3: New enrollments, students and graduates from selected careers. Source: Author's elaboration using the University Statistical Yearbook, 2009.

Early on the decade the federal government established early in the decade diverse sectoral fora aimed at generating a space where the involved actors would be able to meet and, discuss problems and bottlenecks with the intention of jointly designing policies. One of the restrictions most frequently mentioned in these spaces is the shortage of human resources on technical areas and with specific abilities.

When comparing the figures for 2001 and 2006 (SPU Statistical Yearbooks), it is possible to observe that the number of new students opting for these priority careers fell from 63,000 to less than 61,000 in a context of an increasing number of new enrollments, and despite having been advertised as "priority fields". This behaviour implies that the proportion of new enrollments in these areas fell in relation to the total number of students from 19% to slightly over 16%. Additionally, the graduates in the mentioned disciplines accounted for only 12% of the total pool of university graduates, a percentage that results smaller than the historically cumulated figure presented on Table 2.

These results would not be a surprise for many of the economists working on the field of occupation choice. However, this would be for the wrong reasons. As we mentioned previously, for an important part of the profession, the weak interest in these careers is to be explained by a weak demand, influencing, in turn, the salaries to be obtained. We believed that the some of the following comments about computer science, together with that for engineering, provide evidence to the contrary.

Software: growth and bottlenecks Starting on the 1950s, informatics has a rich history in Argentina. Despite the recurrent economic and political changes that characterize contemporary Argentine history, and without the support enjoyed by other sectors, the software industry managed to achieve significant

development. Nowadays, the sectoral perspectives are very promising, it being one of the most dynamic and fast growing sectors in the economy. In addition, a growing portion of the population acknowledges its potential. For instance, the sector was considered among those with the biggest growth expectations in the period 2005-2015 in a survey conducted by the National Observatory of Science, Technology and Productive Innovation.

In relation to employment, the informatics and software chamber of commerce (CESSI) reports that more than 51,000 people worked in the software industry in 2008, hiring almost 6,000 in only one year, this figure almost duplicates that for 2004. Together with the impressive performance of annual growth rates of 20% in sales and 23% in exports since 2002, the shortage of qualified human resources has been mentioned repeatedly as one of the most important bottlenecks to overcome in the short run (ProsperAr, 2008). Specifically, according to estimates presented in the sectoral strategic plan, the sector is expected to employ 70,000 people by 2011 and reaching 100,000 five years later. Recent estimations (Prospectiva TIC, 2008) indicate that the sector will be incapable of finding qualified personnel for up to 21,000 positions, or almost half of the employment that is expected to generate in the next eight years.[16]

As we might expect, both the impressive observed sectoral growth rates and future perspectives are not a secret only available to specialized experts, firm managers or committed policy makers. The general public is aware and informed. In this sense, the National Secretary of Science, Technology and Innovation performed in 2006 the Second National Survey about the Social Perception of Science. As a follow up of a first survey conducted two years before, the initiative aimed at characterizing Argentine society in terms of information about science and technology, the potential that STI has for ameliorating social and economic problems and, as a novelty, different aspects about both the nuclear and software sectors. One dimension that was specifically taken into account was to elucidate the attractive of informatics and related fields as a university career.[17]

When the interviewed individuals were asked to indicate the attractive careers from a provided list, informatics ranked fifth in terms of interest, only after disciplines such as medicine, law, history and education.[18] Those who did not consider informatics as an attractive career were consulted about their reasons. Having to choose from a list of reasons, lack of employment opportunities and lower wages, were indicated as the least important factors. In fact, the main reason had to do with non-pecuniary factors such as being considered a not very entertaining job, followed by lack of information about what the job was about.

[16]The previously presented figures about new enrollments and university graduates allow us to understand the dynamics at the undergraduate level. Because of the lower graduation rates, the situation at the postgraduate and PhD levels is even more dramatic, this being another reason for concern among the experts.

[17]The survey consisted of a household survey that, by means of a random and stratified sample by region, gender and age, results representative of the adult urban population of the country. Almost 2,000 households were interviewed.

[18]The attractiveness of informatics grew in parallel with the level of education and the level of scientific information that the respondent had.

Trying to confirm that the poor performance of the career in terms of the attraction of students is not related to a weak job market, the interviewed were asked about their opinions about the employment opportunities for a graduate from the discipline. Here, the majority believed that the graduates can easily obtain a job. Again, this perception increased together with the level of education of the interviewees.

4 Received literature

Contributions studying the factors that influence the choice of university study field can be divided into two groups. The first group, more inspired by sociological concerns, aims at highlighting the role played by other factors such as family background and social influences. A second group, following the standard economic approach, is focused on assessing the influence played by income or expected earnings. It is rare to find research contributing to both strands. This paper can be thought of as an initial contribution in this direction.

Previous evidence focused on the role of personal background shows that the choice is heavily influenced by factors such as gender, ability and previous education history and performance. In this sense, Davies and Guppy (1997) found in the American case that males and high ability individuals were more likely than females to enroll in lucrative fields of study such as engineering or economics. Beffy et al. (2009) found in France that female students are very signicantly less likely to study sciences. In respect to educational history, these same authors find that those students who obtained a Baccalauréat in sciences are signicantly more likely to choose a post-secondary major in sciences. Similarly, Bratti (2006) for the UK finds that previous student performance in the form secondary school curriculum (school type, A-level score and number and performance in specic A-levels) has an important explanatory power for the field choice.

Family background has proved to have important effects on the decision of what to study. Oosterbeek and Webbink (1997) who studied the decision whether to enroll or not in technical studies in the Netherlands, found that individuals from high income families were less likely to attend these fields, but more likely to persist in their studies. Also in the Dutch case, Van de Werfhorst et al. (2001) found that children belonging to the cultural elite tended to choose fields where they could acquire cultural capital, i.e. non technical fields, while students from the economic elite were under-represented in cultural fields (such as arts and humanities). By contrast, low social class individuals were over-represented in economics and engineering. For France, Beffy et al. (2009) find that students whose mother is a white-collar worker are more frequently enrolled in sciences than in humanities and social sciences. Rochat and Demeulemeester (2001) scrutinized the case for Belgium to find that youngsters with fathers in "elite" occupations were relatively more likely to enroll in short cycle artistic and pedagogical studies and long cycle curricula in engineering and less likely to enroll in long cycle business, economics and social studies. Contrarily, Mont-

marquette et al. (2002) estimated a multinomial logit model of subject choice for Canada and did not find evidence that a parent in a professional occupation influences the choice. However, those students studying thanks to an educational loan were more likely to choose education or liberal arts, where the probability of success was higher on average. Van de Werfhorst et al. (2003) estimated for the UK a multinomial logit model of subject of graduation and found that children from professional backgrounds preferred faculties of medicine and law, even after controlling for ability and exam performances. For the same country, Bratti (2006) does not find statistically signicant differences among social classes in the probability of enrolling in different subjects in the period 1981-1991. At the same time, having a parent of the same sex as the child with university education —according to Boudarbat and Montmarquette (2007), when studying the Canadian case— increases the likelihood of choosing "Health" and avoid Education".[19] In addition, a student is unlikely to choose Business and Commerce when his or her mother received university education. In respect to vocational training, fathers favour studies in sciences fields. Overall, there is limited impact of parents on their childrens choices when parents have less than university education.

The fact that these collection of factors are significant in the choice of university major suggests that non-pecuniary factors are a key determinant of schooling choices. In this sense, it is required to first explore the ultimate determinants of the selection and take into account that the solution to the shortage for some skills does not lie uniquely in the provision of financial incentives.

Recently, different strands of research both from sociology and economics have focused on understanding how the choice of field of study is an important part of a strategy aimed at the successful entry into the labour market. In this sense, it is shown that different fields of science might differ in their value in the labor market either in terms of employment status (Livanos and Nuñez, forthcoming; Reimer and Steinmetz, 2007; Smyth, 2005) or income (Bobbitt-Zeher, 2007; Hansen, 2001). Several reasons have been have been put forward. First, both the learning environments and the acquired skills and competencies vary between fields (Paul and Murdoch, 2007; van de Werfhorst and Kraaykamp, 2001), certain fields being more likely to develop productive skills than others. Secondly, different fields may differ in the extent they provide general versus specific skills. It might be expected that employers —interested in reducing training costs and achieving a better matching— will prefer those individuals having (allegedly) occupation specific skills (van der Velden, 2007). In this sense, most contributions —like those from Arcidiacono (2004) and Marini and Fan (1997)— show that graduates in humanities and so-called "soft fields" typically receive lower wages or income. Third, and from a signalling perspective (Spence, 1973), the completing of a degree in certain fields is assumed to be more related with prior abilities than in other fields (Reimer et al., 2008). The more

[19] These authors only considered the level of education of their parents and not their field of specialization.

challenging fields are also assumed to carry higher rewards. As a consequence, fields of study manage to sort students by their (perceived) ability.[20]

Finally, the value of different fields may vary with the business cycle. In this vein, we can expect that those careers providing more specific skills will be preferred by prospective students in environments more affected by unemployment. Reimer et al. (2008), when analyzing unemployment rates for different fields across 22 European countries, found that humanities graduates (associated with less specific skills) face an above average risk of unemployment.[21] However, if downturns are expected, graduates with very specific occupation qualifications may suffer (or assign a higher probability in their calculation about expected value/utility) higher unemployment or would have to accept lower wages (Reimer, Noelke, Kucel, 2008).

5 Data description

The previous section highlighted the shortages of graduates in the areas of engineering, sciences and technology despite the high expected income and the good employability of these professionals in Argentina. It is obvious that overcoming such a restriction for development requires the combination of two different processes: (a) a growing enrollment in the aforementioned disciplines and, (b) a higher rate of graduation at the undergraduate level of these disciplines. In the sections that follow we will focus on the first of these two issues. Specifically, we will make use of a survey conducted to Advanced University Students (AUS) to try to elucidate what factors influence the decision to follow the so-called "priority" careers.

Taking into consideration that we believe that expected income is only one of the potential factors behind the occupation choice, we will pay attention to different personal characteristics (such as gender, age of entry to university, prior working and higher education experience), family (higher education of both parents, orientation of the parents' higher education, type of occupation), social (proportion of graduates from priority careers in the cities where the surveyed individuals follow their primary and secondary level studies) and economic aspects (unemployment rates and income levels for employed university graduates). The introduction of these three latter aspects constitute an innovation of this work. First, including the proportion of university graduates is inspired by the contributions of Calvó-Armengol and Jackson (2008), who used this same idea in the framework of household surveys (and not surveys of individuals). Second, including information about unemployment and income

[20] If abilities are scarce and the education signal effectively sort individuals, those fields in which success depends on prior ability will carry a higher signal, producing unequal outcomes between fields of science that might be persistant. However, if the sorting is not about abilities, social perceptions about careers might result quite perverse.

[21] Evidence form Europe suggests that in the case of more rigid employment protection legislation –as might be the case in Argentina– the need for more complete screening of applicants will the amplify differences between fields of study, becoming a more important signal (Breen, 2005; Wolbers, 2007).

levels allow us to contribute to the understanding of the ways that the present conditions in the labor market affect the occupation choice.

We should mention that the information used on this paper imposes certain restrictions on our analysis. First, in spite of our interest being the assessment of the factors that influence the decision about what to study, we perform our analysis with an instrument conceived to evaluate the transition between the education and work worlds. Thus, we have a sample of university students that was designed to be representative, attentive at achieving the comparability with a previous research (see Riquelme (ed.), 2008), of the graduations by discipline and not necessarily about the new enrollments at it. At the same time, we don't have information about: the perceptions of the different careers and the expected income and the past educational performance (but we do have the orientation of their secondary school). Also, there is no information about the strategies that the individuals follow to obtain information and decide (counseling, visits and talks, tests, specialized publications and books, etc.). Introducing these dimensions would be important for an exhaustive empirical analysis and policy design.[22]

5.1 Survey characteristics

The survey that provides the data used in this paper arises from a re-edition of a survey originally conducted in 1985 being, at that time, the first survey to characterize the advanced student population and its transition to the labour market.

The sample of universities used in this study allows us to characterize properly the heterogeneity that defines both the student population and the university system in the country. Each of these universities is located in a different geographical region, and presents its own history and trajectory. These aspects have defined in each case a different academic offering and variety in the number of students and its evolution. These universities are representative of the graduation rates and the distribution of students across fields.[23] As we can see from Table 4 the distribution of new enrollments in the analyzed universities is similar to the proportion exhibited by the total system.

5.2 Description of the interviewed population

This section presents a characterization of the 3,913 advanced university students interviewed in the three mentioned public universities. Table 5 presents a distribution of the interviewed population across the most relevant dimensions.

In line with the gender distribution for the university system as a whole,[24] 61.7% of our survey respondents are female. In relation to place of birth, we

[22] In this respect, see Tacsir (2009b) where a specially designed survey considering perceptions, expected income and information gathering strategies is used.

[23] Annex A presents a characterization of these 3 universities, their history, geographical location and economic activity of their surrounding regions.

[24] In 2005, 56.6% of total new university enrollments were female.

Disciplines	New enrollments on Surveyed universities (%)	Total system (on %)
Applied Sciences	26.2	21.1
Basic Sciences	2.7	3.6
Health Sciences	19.4	16.4
Humanities	14.1	17.9
Social Sciences	37.5	41.1
Total	100.0	100.0
Non priority	88.9	87.5
Priority	11.1	12.5

Table 4: Distribution across disciplines for the new enrollments for the the surveyed universities and the total system. On percentages. Source: Author's elaboration based on University Statistics Yearbook, 2006.

observe that only a tiny minority was born outside Argentina. At the time of the interview, only a small group had a work experience or had obtained a prior tertiary degree (15.8% and 10.7%, respectively) (see Table 5.a). Additionally, only 5% of our sample started their studies older than 24 years.

In line with a growing trend observed in the country in the last decades, 57.9% of our interviewees attended a private secondary school, those who followed a technical track (most common also in public managed schools) being only a slight minority. At the same time, the sample of interviewed individuals serves as a good representation of the population of new university students in the country. In particular, both social sciences and humanities represent bigger proportions in our sample than in both the total system and the universities analyzed because of the important graduation rates that the students in this area present in comparison to other fields. The opposite explains the situation in relation to basic sciences. In respect to the situation of the group of priority fields, 14.4% of our interviewed individuals are about to finish their studies in these careers, presenting a figure one percentage point over the national proportion. (Table 5.b).

Table 5.c summarizes the family background of the interviewed individuals. There, we see that about half of the interviewees' parents followed their studies beyond the compulsory secondary level (51.6% for mothers and 53.6% for fathers). In relation to their educational and occupational specialization, we observe that 12.4% of their fathers studied a priority field, while 15.8% work in science, technology and engineering (ST&E) related fields.[25] These proportions

[25]The correlation between these two variables is 0.46. This is explained by many fathers that despite not obtaining their education certification in a priority field-either at the tertiary or university levels- work in occupations requiring technical and/or scientific knowledge. The definition of the variable capturing the occupation specialization took the following occupational categories from the National Occupation Classification: Engineers; Technicians and

Basic characteristics of the surveyed individuals and relevant population			
		Sample	Population
a. Personal characteristics			
Gender	0: Female	61.7	56.6
n= 3913	1: Male	38.3	43.4
Foreign	0: Non foreign born	98.4	97.8[a]
n= 3910	1: Foreign born	1.6	2.1
Older age	0: Below 25 years old when started	95.0	77.5[b]
n= 3913	1: 25 or more years old when started	5.0	22.5
Work experience	0: Without experience	84.2	n.a.
n= 3913	1: With experience	15.8	n.a.
Previous tertiary ed. degree	0: Without previous degree	89.3	90.6[a]
n= 3913	1: With previous degree	10.7	9.4
b. Educational history			
Type of school	0: Public school	42.1	41.7[c]
n= 3910	1: Private school	57.9	58.3
School track	0: Non technical education	92.8	91.9[a]
n= 3910	1: Technical education	7.2	8.1
Field of Science	1: Applied sciences	15.5	20.2
n= 3910	2: Basic sciences	3.7	2.4
	3: Health sciences	11.6	18.0
	4: Humanities	23.5	17.5
	5: Social sciences	45.6	41.9
Type of career	0: Non priority	85.7	86.9
n= 3910	1: Priority	14.3	13.1
c. Family background			
Mother's education	0: Without higher education	48.4	52.9[a]
n= 3913	1: With higher education	51.6	47.1
Father's education	0: Without higher education	46.4	53.9[a]
n= 3913	1: With higher education	53.6	46.1
Mother's h. ed. specialization	0: Non priority	99.9	n.a.
n= 3913	1: Priority	0.1	n.a.
Father's h. ed. specialization	0: Non priority	87.6	n.a.
n= 3913	1: Priority	12.4	n.a.
Mother's occupation specialization	0: Non priority	96.8	n.a.
n= 3913	1: Priority	3.2	n.a.
Father's occupation specialization	0: Non priority	84.2	n.a.
n= 3913	1: Priority	15.8	n.a.

[a] Corresponds to data from the UBA students census from 2004.
[b] Age distribution for new enrollments at the university. Source: SPU.
[c] High school graduates in the country by track followed. Source: Ministry of Education (2008).

Table 5: Main characteristics of the survey respondents and the population of advanced university students. In percentages.

are much smaller the case of their mothers: 0.1% and 3.2%, respectively.

5.3 Comparison of Priority and Non priority fields

Attending our objective of being capable of understanding the factors influencing the decision to enroll in a priority field, this section will focus on comparing the characteristics of the students in priority and non priority fields.

In relation to gender, we observe that the growing proportion of females in the university studentship population is not yet visible in priority fields. In this respect, while only 30,2% of the interviewed students enrolled in priority fields are women, this figure rises to 67% in the case of non-priority fields. Table 6.a describes this situation.[26]

At the same time, it is possible to characterize the students in priority fields as younger students who enrolled at the university without working experience or other higher education. In this sense, those students involved in priority fields are less likely than the rest to have worked before their enrollment at the university. In fact, while 11% of the AUS in the priority fields had this experience, this proportion rises to 16.7% for those about to graduate from non priority fields. Similarly, the proportion of students about to finish their university studies in the priority disciplines that inform that they hold a diploma from another tertiary-level studies is smaller than for those enrolled in non priority disciplines (6% and 11.6%, respectively). In the same line, only a insignificant percentage of the students in priority fields (0.9%) started their studies with 25 years old or more, while this proportion reaches almost 6% for those in non priority fields.

In relation to the educational history of the students, we find (as expected) a bigger proportion of students with technical orientation on their high school studies among the AUS on priority fields in comparison to those in non-priority careers. In fact, 23.3% of those in priority fields attended a technically oriented high school, while an almost negligible 4.4% represent the equivalent group in non-priority fields. Unfortunately, we can not compare this proportion with the percentage exhibited by the system as a whole for lack of statistical information. Nevertheless, we can expect that the public university system will present percentages similar to those exhibited by the University of Buenos Aires, where 26.8% of the students at priority fields obtain a technically oriented education at the secondary level, this proportion being around 9% for those in non technical fields (UBA Student Census, 2004). In relation to the sector (public or private) of the secondary education, the Ministry of Education reports that the private sector concentrates slightly more than one third of the total students of the secondary level without being possible to know the proportion in the group that

similar occupations; Other technicians; Specialized workers on services; Specialized workers on agricultural activities; Production and Shop supervisors.

[26] It should be noted that this fact is valid for the university system as a whole. According to the University Statistical Yearbook, females represent around 29% of the total new enrollments in the priority fields, while this figure rise to 61% in the non prioritary fields. Additionally, this fact stands for each of the three universities considered in our survey.

	Interviewee's type of career		
	Non priority	Priority	Total
a. Gender			
Female	67.0	30.2	61.7
Male	33.0	69.8	38.3
b. Type of school			
Public school	41.6	44.4	42.1
Private school	58.4	55.6	57.9
c. Secondary school track			
Non technical education	95.6	76.7	92.8
Technical education	4.4	23.3	7.2
d. Mother's education			
No education	0.2	0.0	0.1
Incomplete Primary	2.8	1.4	2.6
Completed Primary	13.4	6.6	12.5
Incomplete Secondary	10.0	6.4	9.5
Completed Secondary	24.4	20.6	23.8
Incomplete Higher Ed.	12.7	13.3	12.8
Completed Higher Ed.	36.3	51.5	38.8
e. Father's education			
No education	0.1	0.0	0.1
Incomplete Primary	4.8	2.0	4.4
Completed Primary	13.1	6.2	12.1
Incomplete Secondary	12.6	8.2	11.9
Completed Secondary	18.1	16.2	17.8
Incomplete Higher Ed.	14.8	13.2	14.5
Completed Higher Ed.	36.5	54.3	39.1
f. Mother's in priority fields	0.1	0.0	0.1
g. Father's in priority fields	9.8	27.5	12.4
h. Mother's occupation by type			
Non priority	96.9	96.2	96.8
Priority	3.1	3.7	3.2
i. Father's occupation by type			
Non priority	86.3	71.8	84.2
Priority	13.7	28.2	15.8

Table 6: Main characteristics of the survey respondents type of career they choose. In percentages.

graduates. In this respect, our interviewees do not show differences in terms of the sector of their secondary education by type of career that they are enrolled in. In this respect, while 55% of those in a priority fields attended a private school, the proportion for those in non priority fields is slightly higher reaching 58.3%.

At this point, it becomes clear that these characteristics of the students in the priority fields is related to its family background (see Table 6). In this sense, the higher educational level of the their fathers stands out in the comparison. While 67.5% of their parents attended higher education, this category only agglutinates 50% for the case of non priority fields. Specifically, 54.3% of the fathers of priority-fields students have finished their higher education studies. Similar situation arises when we consider the education level of the mothers for each group of students (65% in priority fields versus 49% for those in non priority fields). Here, the main difference between the two groups is caused by the important percentage of mothers who completed their university studies.

As mentioned previously, it is our contention that an important influence on the choice of field of study is the orientation that parents have both in terms of their education and occupation specialization. We observe that the students whose fathers have specialized on a priority field present a stronger tendency to specialize on these fields, also. Despite the heterogeneity between the students from different universities, stands out that while 27.5% of the students choosing priority fields have fathers specialized on the same fields, this proportion falls to 10% for those students in a non-priority fields (Table 6.g).

In respect to the orientation of the occupation for each parent, Table 6.g shows that while a small proportion of students of non-priority fields have fathers whose occupation are oriented towards priority areas (13.7%), an important group of students of priority fields (28.2%), almost doubling the figure of parents with priority occupations on the total sample, have fathers with this specialization. Finally, the mothers don't show differences in terms of the distribution of students by type of career in relation to their mother's education or occupation specialization (see Table 6.f and Table 6.h).[27]

Summarizing, we observe that students choosing priority fields are more likely to have been exposed to technical related and priority fields both at their previous education and because of their family background. In fact, they have parents that exhibit higher levels of education and, specifically, a higher proportion of them are trained in these same priority areas. In addition, fathers of students choosing priority fields have a higher tendency to be involved in occupations related with priority fields. All these factors are supposed to expose individuals differently, providing different sets of information and transmitting a potentially different values affecting the occupation choice.

[27] These results are identical if we split the sample by the interviewee's gender.

6 Empirical strategy and results

The previous section highlighted several dimensions where the students choosing priority fields at the university level present significant differences from those enrolled in non-priority disciplines. Here, we examine the influence that diverse explanatory factors have on the probability of choosing priority fields. We apply a sequential strategy wherein the successive regressions will include new explanatory factors advancing from purely individuals factors towards those related to characteristics of the social environment in which the individual is embedded at the time of choosing her occupation.

6.1 Hypotheses

As discussed in Section 2 we expect to find that individual decisions respond not only to pecuniary aspects (labour market conditions) but are also mediated by a collection of factors related to social background, family influences and social context. In this sense, these three groups of factors produce an idiosyncratic assessment of the individual costs and benefits of the different choices available. Thus, we postulate the following hypotheses:

H1: Individual exposure to technical knowledge has a positive influence on the decision to opt for a priority field.

H2: Parental specialization in priority fields have a positive influence on the decision to pursue a priority field.

H3: Living in locations with a higher proportion of individuals with a specialization in priority fields has a positive influence on the decision to choose a priority field.

In relation to the dynamism of the labour market and according to the evidence presented in 4 we propose the following hypotheses:

H4: Higher unemployment rates for university graduates have a positive influence on the decision to choose a priority field.

H5: On the contrary, higher wages received by university graduates negatively affect the decision to choose a priority field.

Here, we are not able to identify how much the effect on the occupation choice of H2 is a consequence of differential access to information, access to some advantage in both education and labour market performance or a intergenerational transmission of a specific symbolic attached to each occupation. However, we can understand further the channel by which the influence is transmitted by empirically operationalize this hypothesis in two different components:

H2.1: Parents' educational specialization in priority fields have a positive influence in the probability of choosing such a career.

H2.2: Parents' occupational specialization in priority fields have a positive influence in the probability of choosing such a career.

Similarly, in respect to H3, it is impossible to differentiate whether the "social" effect on the occupation choice is related to a desire to conform to a norm, different social valuation of the different careers or an effect related to the extent that there are different role models or information about certain fields that, without meeting a minimum threshold is no available.

6.2 Econometric approach

Our focus lies in understanding which factors have an influence on the election of a "priority career". Thus, and given that all our interviewed individuals are students at the university,[28] two different groups of students exist: those enrolled in non-priority fields and those enrolled in priority fields. Taking this as our starting point, our strategy consists in estimating the probability of having opted for a priority discipline in relation to the explanatory factors by means of maximum-likelihood probit model with robust standard errors..

Hence, our model can be expressed as:
$y_i^* = x_i\beta_i + u_i$, where β is a vector of explanatory factors and y^* is an unobservable magnitude that represents the net benefit of taking a particular course (i.e., opting for a priority field) of action for the individual i. Nevertheless, we can indeed observe the outcome of this individual decision based on the following rule:

$y_i = 0$ (i.e., enrolled on a non priority field) if $y_i^* < 0$

$y_i = 1$ (i.e., enrolled on a priority field) if $y_i^* \geq 0$.

Our first analysis is the most basic of three stages to be presented and it refers to individual variables only, without taking into account other factors related to parents, family or social surroundings. In this first estimation we present the effects of gender, age of first enrollment at the university, track of the secondary level education, type (public or private) of school, nationality, previous work experience and holding a previous higher education diploma on the probability of choosing a priority field. Results are presented in Table 7.

Thus, following a technical track at the secondary level and being a male (in that order) are the factors that contribute to the election of a priority field. By contrast, being at least 25 years old at the time of the first enrollment, together with previous working or higher education experience negatively affect this probability. At the same time, the type of high school and the place of birth

[28] Tacsir (forthcoming) presents a sequential analysis of the occupation choice where the first stage is the decision to whether enroll or not at the university.

of the individual are not significant factor in terms of the occupation choice decision. The promotion of the technical track stands as a fundamental policy for the promotion of scientific and technical will on the young population.[29] Finally, the fact that these professions are mostly considered attractive to male students makes us consider the need to work on the perception of these careers, this being a possible constraint to induce female youngsters to choose them.

	Personal aspects	
Explanatory factors	Results	Marginal effects
Gender[a]	0.726	0.16
	(0.551)***	
Private education [b]	0.051	—
	(0.055)	
Technical track[c]	0.877	0.25
	(0.086)***	
Foreign[d]	0.181	—
	(0.224)	
Older age[e]	−0.875	−0.10
	(0.234)***	
Previous degree[f]	−0.219	−0.04
	(0.103)***	
Previous job[g]	−0.315	−0.05
	(0.080)***	
n	3910	
Prob. LR	***	

Table 7: Sign, significance levels and marginal effects for the explanatory factors of the probability of choosing a priority field. Notes: a: 0-Female & 1-Male; b: 0- Attended a public school & 1-Attended a private school; c: 0-Non technical school & 1-Technical track school; d: 0-Born in Argentina &1-Foreign born; e: 0-Younger than 25 years old when started & 1-At least 25 years old when started; f: 0-No previous higher education degree & 1-With a previous higher education degree; g: 0-Without previous working experience of more than 15 hours a week (before starting university) & 1-With previous working experience. Significance * 10%, ** 5%, *** 1%. Robust standard errors in parentheses.

As a second step, and starting from the results of the first regression, we include aspects related to family influence as explanatory factors. Here, we will present three different models that take into account different variables concerning the family environment. In the first model (Model 1), we add two different

[29]This aspect is of fundamental importance in the Argentine case. During the nineties, a drastic modification of the organization of the secondary schooling system affected specially the existence of technically oriented schools in the majority of the country. Gallart (2006) presents a detailed account of the transformations experienced. Polino (2008) addresses the perception about technical and scientific occupation in the young population.

factors: whether either of the interviewee's parents (father and mother each as a separated explanatory factor) attended or not higher education institutions. Model 2 additionally includes the educational orientation (whether oriented towards priority fields or not). Finally, Model 3 adds the specialization of their occupation. Table 8 shows the results.

A first point observation is the fact that the introduction of the family characteristics affects neither the size nor the significance of the explanatory factors previously considered. Additionally, family characteristics are significant and present the expected signs. In this sense, the first model shows that those individuals with parents that have attended higher education are more likely to choose a priority field. While the mother's level of education remains significant to the three alternative specifications, father's level of education becomes not significant in the presence of a variable that characterizes the educational specialization (Model 2) or the occupation specialization (Model 3). In reference to this, the channel through which the father influences the likelihood of choosing a priority field is in terms of their specialization (both educational and occupational) while the mothers' influence goes through the level of education acquired.[30] This latter factor is probably indicating that the interviewees' household has an important income, also.

In terms of the marginal effects for each of the significant variables, we find that following a technical track at high school followed by father's (both educational and occupational) specialization are most important factors. This two last factors give support to the idea that the assessment of the alternative can not be considered as a decision isolated from family background and arising from pure globally accessible information. Here, we can speculate that both differential access to information about the career and related occupations' characteristics and a potential more advantageous position in the job market influence the perception about future opportunities that different university options provide. Thus, it is quite likely that we will find intergenerational inertia. In this sense, attracting young individuals requires to intervene in the information and career guidance markets with the intention of granting equal access to relevant information, unbiased by the experiences of previous generations.[31]

As a third stage, we include information about the surroundings where the youngsters socialize during their high school. This is the period where they were presumed to decide whether to attend university or not and what to study if they did. During this process they collected information, research about people's experiences and most likely received information and other's opinions. Here, we consider that information has a local component and different individuals will

[30] Her orientation being not significant.

[31] The research about first generation university students arrives to similar conclusions. At this respect, the first individual that enrolls in higher education studies are more inclined to choose for shorter studies (two instead of four year colleges in the US) because of a unbiased perception about their future opportunities and the probability of finishing their studies.

	Personal and Family aspects: 3 specifications		
Explanatory factors	Model family 1	Model family 2	Model family 3
Gender[a]	0.696	0.696	0.699
	(0.055)***	(0.056)***	(0.056)***
Private education[b]	-0.005	-0.010	-0.008
	(0.056)	(0.057)	(0.057)
Technical track[c]	0.911	0.913	0.904
	(0.086)***	(0.086)***	(0.086)***
Foreign[d]	0.005	0.000	-0.028
	(0.226)	(0.223)	(0.221)
Older age[e]	-0.750	-0.742	-0.746
	(0.236)***	(0.237)***	(0.237)***
Previous degree[f]	-0.254	-0.241	-0.244
	(0.104)**	(0.106)**	(0.107)**
Previous job[g]	-0.263	-0.271	-0.272
	(0.082)***	(0.082)***	(0.082)***
Mother's higher education[h]	0.207	0.195	0.201
	(0.059)***	(0.060)***	(0.611)***
Father's higher education[h]	0.254	0.088	0.095
	(0.061)***	0.066	0.066
Father's priority education[i]		0.608	0.472
		(0.073)***	(0.085)***
Mother's priority occupation[j]			-0.158
			(0.152)
Father's priority occupation[j]			0.271
			(0.078)***
n	3910	3907	3907
Prob. LR	***	***	***

Table 8: Sign, significance levels and marginal effects for the explanatory factors of the probability of choosing a priority field. Notes: a: 0-Female & 1-Male; b: 0- Attended a public school & 1-Attended a private school; c: 0-Non technical school & 1-Technical track school; d: 0-Born in Argentina &1-Foreign born; e: 0-Younger than 25 years old when started & 1-At least 25 years old when started; f: 0-No previous higher education degree & 1-With a previous higher education degree; g: 0-Without previous working experience of more than 15 hours a week (before starting university) & 1-With previous working experience; h: 0-Not attended higher education &1-Attended higher education; i: 0-Higher education in a non priority field & 1-Higher education on a priority field; j: 0-Occupied on a non priority field & 1: Occupied on a priority field. Significance * 10%, ** 5%, *** 1%. Robust standard errors in parentheses. Mother priority education is excluded because of the small number of cases.

Personal and Family aspects: Model family 3	
Explanatory factors	Marginal effects
Gender[a]	0.14
Private education[b]	—
Technical track[c]	0.25
Foreign[d]	—
Older age[e]	-0.09
Previous degree[f]	-0.04
Previous job[g]	-0.04
Mother's higher education[h]	0.04
Father's higher education[h]	—
Father's priority education[i]	0.11
Mother's priority occupation[i]	—
Father's priority occupation[j]	0.05

Table 9: Marginal effects for the explanatory factors for the probability of choosing a priority field (Model Family 3). Notes: a: 0-Female & 1-Male; b: 0-Attended a public school & 1-Attended a private school; c: 0-Non technical school & 1-Technical track school; d: 0-Born in Argentina &1-Foreign born; e: 0-Younger than 25 years old when started & 1-At least 25 years old when started; f: 0-No previous higher education degree & 1-With a previous higher education degree; g: 0-Without previous working experience of more than 15 hours a week (before starting university) & 1-With previous working experience; h: 0-Not attended higher education &1-Attended higher education; i: 0-Higher education in a non priority field & 1-Higher education on a priority field; j: 0-Occupied on a non priority field & 1: Occupied on a priority field. Significance * 10%, ** 5%, *** 1%. We only present the marginal effects for significant explanatory factors. Others are reported as "—".

have access to potentially different information. Taking the information provided by the most recent population census (2001), we add as an explanatory factor the proportion of university graduates over total graduates in the county where they followed their secondary schooling. Using information provided by the Argentine Household survey we include variables aimed at characterizing the labour market for university graduates: the unemployment rate and the expected income.[32] Table 10 presents these results. Model 1 includes in addition to the proportion of graduates have included the unemployment rate for university graduates as an explanatory factor. Model 2, adds to the (centered) expected income as an explanatory factor (Model 2). Table 10 presents these results.

There, we can observe that the newly added variables (either in Model 1 or Model 2) are significant and their signs conform to our previously presented hypotheses. In this sense, we found that a higher proportion of graduates in priority fields positively affects the probability of choosing such group of university careers no matter which variable characterizing the labour market is also considered. At the same time, Model 1 shows that a higher unemployment rate for university graduates positively influences the probability of choosing a priority field. In this sense, we can think of priority fields being conceived as a shelter for unemployment. Model 2 shows that in those locations where the expected income of the university graduates is higher (i.e., more dynamic labour markets) the attraction of priority fields decreases.[33,34] At the same time, these inclusions don't affect the significance levels or implications for the previously considered factors.

It is important to mention that we are not drawing any specific conclusions with respect to the channel of transmission from the proportion of graduates to individual choice. Even when we cannot disentangle whether its influence is the result of an active labour market for that type of profession, differential access to information, a higher reputation in the individual's environment, a desire to emulate, we can not disregard this effect when analyzing the reality and formulating policies.[35]

Finally, the differences found between males and females in terms of the probability of opting for a priority field, fosters our curiosity for understanding

[32] Specifically, being U_{gi} the unemployment rate for the university graduates at the location i and Y_{gi} the average income of university graduates in location i, $EY_i = (1 - U_{gi}/100)Y_{gi}$.

[33] To avoid the interpretation that regions with higher proportion of graduates from priority fields are those with higher unemployment or lower income levels, we have also performed additional estimations considering the unemployment and expected income for the whole urban population –not only for urban population holding an university degree. In this case, unemployment is not significant but the expected income remains significant and with a negative sign. In both cases, the proportion of university graduates from priority fields have a positive effect on the probability of choosing such a career.

[34] In fact, unemployment rates for university graduates is slightly and negatively correlated (-0.09) correlated with the proportion of graduates in priority fields. The contrary is true for the correlation between this proportion and the expected income (0.85).

[35] The results are the same if we include the proportion of graduates in the location where the individuals attended either primary or secondary school.

	Personal, Family, Social and Economic factors			
	Model 1		Model 2	
Explanatory factors	Results	Marginal effects	Results	Marginal effects
Gender[a]	0.703	0.144	0.703	0.146
	(0.058)***		(0.058)***	
Private education[b]	-0.052	—	-0.028	—
	(0.059)		(0.059)	
Technical track[c]	0.875	0.237	0.875	0.239
	(0.089)***		(0.088)***	
Foreign[d]	0.014	—	-0.009	—
	(0.233)		(0.232)	
Older age[e]	-0.733	-0.087	-0.715	-0.087
	(0.243)***		(0.244)***	
Previous degree[f]	-0.253	-0.041	-0.241	-0.040
	(0.109)**		(0.110)**	
Previous job[g]	-0.217	-0.036	-0.242	-0.041
	(0.084)***		(0.084)***	
Mother's higher education[h]	0.182	0.033	0.181	0.034
	(0.064)***		(0.063)***	
Father's higher education[h]	0.071	—	0.083	—
	(0.069)		(0.069)	
Father's priority education[i]	0.450	0.101	0.458	0.104
	(0.088)***		(0.088)***	
Mother's priority occupation[i]	-0.201	—	-0.202	—
	(0.166)		(0.164)	
Father's priority occupation[j]	0.253	0.052	0.254	0.053
	(0.083)***		(0.082)***	
Proportion of graduates	0.146	0.027	0.336	0.063
	(0.048)***		(0.114)***	
Unemployment	0.097	0.017		
	(0.021)***			
Expected Income			-0.861	-0.161
			(0.381)**	
n	3629		3629	
Prob. LR	***		***	

Table 10: Sign, significance levels and marginal effects for the factors affecting the probability of choosing a priority field. Notes: a: 0-Female & 1-Male; b: 0- Public school & 1-Private school; c: 0-Non technical track & 1-Technical track; d: 0-Born in Argentina &1-Foreign born; e: 0-Younger than 25 when started & 1-At least 25 when started; f: 0-No previous degree & 1-With previous degree; g: 0-Without working experience & 1-With working experience; h: 0-Not attended HE &1-Attended HE; i: 0-Higher education in a non priority field & 1-Higher education in a priority field; j: 0-Occupied on a non priority field & 1: Occupied on a priority field. Significance * 10%, ** 5%, *** 1%. Robust standard errors in parentheses. We only present marginal effects for significant factors. Others are reported as "—".

whether there are other types of differences between these two groups in terms of both personal, family and social factors. To shed light on these issues we ran the last model separately for each group (see Table 11 and Table 12 for the results). In the first place, we find some differences in relation to two personal factors: older age when first enrolled and holding a previous diploma. Both factors while have significant negative effects for males are non significant in the case of women.

In what is related to intergenerational transmission of information about careers, we observe that the channels which influence the probability of inclining for a priority field are different for each gender. While males are positively influenced on their decision by having a father whose education is oriented toward these fields, females are affected by their father's occupation. It is worth mentioning that both genders are positively influenced in their decision by their surrounding environment, via the proportion of graduates on priority fields in the total pool of university graduates. Finally, all other factors have the same significance and sign. Then, following a technical technical at the secondary level and having a mother who attended higher education increase the probability. On the contrary, previous working experience negatively affects the likelihood of going into a priority field.

7 Conclusions

The present paper aims to contribute to a better understanding of the process of education choice. Available evidence shows that, unfortunately, mobilizing individuals towards these high priority careers is neither an easy nor a mechanical task. It is our contention that understanding this complex process requires paying attention to a variety of factors including personal, family and social aspects. Thus, we should not exclude economic factors in the analysis but we should not, either, limit our understanding to their influence. Thus, our starting point was a characterization of the dominant view in economics as unsatisfactory, taking us to explore different contributions that will permit to enrich the economic perspective on the issue, setting the stage for more effective policy recommendations.

Our description of the current situation in Argentina highlighted the shortages of graduates in the areas of engineering, sciences and technology despite the high expected income and the good employability. Interested in understanding the influence that different personal, family, social and economic factors have on the decision about what to study, we perform a sequential analysis profiting from a survey to Advanced University Students (AUS).

This analysis showed, first, that the exposure to technical knowledge during the formative years has a positive influence on the decision to opt for a priority field, finding that the probability of being enrolled in such a career is higher for those students who followed technical tracks in secondary school. This finding is of vital importance for the case of our study. During the previous decade, an

Personal, Family, Social and Economic factors by gender (Model 1)				
	Male		**Female**	
Explanatory factors	Results	Marginal effects	Results	Marginal effects
Private education[a]	-0.057		-0.057	
	(0.082)		(0.087)	
Technical track[b]	0.927	0.33	0.830	0.17
	(0.102)***		(0.202)***	
Foreign[c]	0.010		0.122	
	(0.324)		(0.323)	
Older age[d]	-1.200	-0.22	-0.283	
	(0.329)***		(0.265)	
Previous degree[e]	-0.386	-0.10	-0.110	
	(0.163)**		(0.140)	
Previous job[f]	-0.252	-0.07	-0.201	
	(0.109)**		(0.134)	
Mother's higher education[g]	0.224	0.07	0.165	0.02
	(0.088)**		(0.093)*	
Father's higher education[g]	0.115		0.014	
	(0.096)		(0.100)	
Father's priority education[h]	0.686	0.24	0.142	
	(0.123)***		(0.136)	
Mother's priority occupation[i]	-0.225		-0.202	
	(0.240)		(0.116)	
Father's priority occupation[i]	0.136		0.417	0.06
	(0.115)		(0.116)***	
Proportion of graduates	0.106	0.03	0.292	0.03
	(0.067)*		(0.069)***	
Unemployment	0.129	0.04	0.057	0.04
	(0.029)***		(0.032)***	
n		1382		2247
Prob. LR		***		***

Table 11: Sign, significance levels and marginal effects for the explanatory factors of the probability of choosing a priority field by interviewee's gender. Notes: a: 0- Public school & 1-Private school; b: 0-Non technical track & 1-Technical track; c: 0-Born in Argentina &1-Foreign born; d: 0-Younger than 25 when started & 1-At least 25 when started; e: 0-No previous degree & 1-With previous degree; f: 0-Without working experience & 1-With working experience; g: 0-Not attended HE &1-Attended HE; h: 0-Higher education in a non priority field & 1-Higher education in a priority field; i: 0-Occupied on a non priority field & 1: Occupied on a priority field. Significance * 10%, ** 5%, *** 1%. Robust standard errors in parentheses. We only present marginal effects for significant factors. Others are reported as "—".

Personal, Family, Social and Economic factors by gender (Model 2)				
	Male		**Female**	
Explanatory factors	Results	Marginal effects	Results	Marginal effects
Private education[a]	-0.029		-0.061	
	(0.081)		(0.088)	
Technical track[b]	0.929	0.33	0.840	0.17
	(0.102)***		(0.202)***	
Foreign[c]	0.013		0.074	
	(0.325)		(0.328)	
Older age[d]	-1.165	-0.22	-0.285	
	(0.337)***		(0.267)	
Previous degree[e]	-0.374	-0.10	-0.118	
	(0.163)**		(0.141)	
Previous job[f]	-0.281	-0.08	-0.205	
	(0.108)**		(0.134)	
Mother's higher education[g]	0.223	0.07	0.172	0.02
	(0.088)**		(0.093)*	
Father's higher education[g]	0.141		0.009	
	(0.095)		(0.101)	
Father's priority education[h]	0.694	0.24	0.134	
	(0.122)***		(0.137)	
Mother's priority occupation[i]	-0.235		-0.196	
	(0.236)		(0.226)	
Father's priority occupation[i]	0.157		0.413	0.06
	(0.114)		(0.117)***	
Proportion of graduates	0.223	0.07	0.608	0.07
	(0.135)*		(0.176)***	
Expected Income	-0.001	-0.01	-0.001	-0.00
	(0.000)**		(0.001)*	
n		1382		2247
Prob. LR		***		***

Table 12: Sign, significance levels and marginal effects for the explanatory factors of the probability of choosing a priority field by interviewee's gender. Notes: a: 0- Public school & 1-Private school; b: 0-Non technical track & 1-Technical track; c: 0-Born in Argentina &1-Foreign born; d: 0-Younger than 25 when started & 1-At least 25 when started; e: 0-No previous degree & 1-With previous degree; f: 0-Without working experience & 1-With working experience; g: 0-Not attended HE &1-Attended HE; h: 0-Higher education in a non priority field & 1-Higher education in a priority field; i: 0-Occupied on a non priority field & 1: Occupied on a priority field. Significance * 10%, ** 5%, *** 1%. Robust standard errors in parentheses. We only present marginal effects for significant factors. Others are reported as "—".

extensive reform of the secondary education system almost brought to an end the technical track at this level. Additionally, parental specialization — both in terms of post-secondary education and labour market– influence the decision about what to study. Specifically, we found that males are positively affected by orientation of their father's education, while females' decisions are influenced by their father's occupation type. For both genders, having a mother with higher education studies positively affects the probability of choosing a priority field. These results are of fundamental importance in light of the expansion of the university system currently in place in the country. As we mentioned previously, slightly more than half of the new enrollments are females. However, the proportion of students in priority fields is not yet growing given the the expansion of female students (and graduates) in the university.

In this line, we found that the surroundings where the youngsters socialize during their high school play an important role on the decision of what to study. This is the period in which they were presumed to decide whether to attend university or not and what to study if they did. During this process they collected information, research about people's experiences and most likely received information and other's opinions. In this sense, we find that a higher proportion of graduates in priority fields as a share of the total number of graduates increases the probability of becoming enrolled in priority field. At the same time, we observe that the dynamism and characteristics of the local labour markets have an important influence in the occupation choice. Specifically, it is shown that a higher unemployment rate for university graduates positively influences the probability of choosing a priority field. In this sense, we can think of priority fields being conceived of as a shelter for unemployment. Additionally, we find that when the expected income of the university graduates is higher the attraction of priority fields decrease. This finding might explain why despite the important growth –mostly based on a rocketing performance of the manufacturing industry– experienced by the Argentine economy recently has not attracted young individuals into technical or scientific related fields.

Hence, we observe an intricate interaction between pecuniary and non pecuniary factors. While the decisions of previous generations influence (and potentially inhibit) the likelihood of opting for a science and engineering (ST&E) related career, these studies are considered by many prospective students as an extreme option, only attractive in the event of current severe unemployment figures. Having said this, it becomes evident that attracting bright individuals to ST&E fields (and occupations) will require going beyond the well-established policy of providing financial assistance to the prospective students. In this sense, our results show that is fundamental to act in two complementary dimensions: (a) information and guidance counseling provision and (b) campaigns to modify the "public image" of the so-called priority careers, enabling them to be understood as a relevant option across all phases of the business cycle.

References

[1] Aghion, P. and P. Howitt, 1992, "A Model of Growth through Creative Destruction", *Econometrica* 60, $323-351$.

[2] Acemoglu, D. (1995), "Reward Structures and the Allocation of Talent, *European Economic Review*, 39,$17-34$.

[3] Akerlof, G.A. (1980), "A theory of social custom of which unemployment may be one consequence, *Quarterly Journal of Economics*, 94, $749-775$.

[4] Akerlof, G. A. and R. E. Kranton (2000), "Economics and Identity", *Quarterly Journal of Economics*, 115, 3, $715-753$.

[5] Arcidiacono, P. (2004), "Ability Sorting and the Returns to College Major", *Journal of Econometrics*, 121 $(1-2)$, $343-75$

[6] Banerjee, A.V.(1992), "A simple model of herd behaviour, *Quarterly Journal of Economics*, 107, $797-817$.

[7] Baudelot, C. and Leclerc, F., (2005), *Les effets de l'éducation*, Paris, Ed. La Documentation franaise.

[8] Baumol, W.(1990), "Entrepreneurship: Productive, unproductive and destructive, *Journal of Political Economy*, 98, $893-921$.

[9] Becker, G. S. and Tomes, N. (1986), "Human Capital and the rise and fall of families", *Journal of Labor Economics*, 4, 3, $S1-S39$.

[10] Beffy , M., Fougere, D. and Maurel, A. (2009), "Choosing the Field of Study in Post-Secondary Education: Do Expected Earnings Matter?", *IZA DP*, No. 4127.

[11] Benabou, R. and J. Tirole (2006), "Identity, Dignity and Taboos: Beliefs as assets, mimeo Princenton University and University of Toulouse.

[12] Bentolila, S., Michelacci, C. and Suarez, J., (2004), "Social contacts and occupational choice, *CEMFI Working Paper 0406*.

[13] Bikhchandani, S., Hirschleifer, D., Welch, I., (1992), "A theory of fads, fashion, custom and cultural change as informational cascades", *Journal of Political Economy*, 100, $992-1026$.

[14] Bisin, A., Verdier,T., (2000), "Beyond the Melting Pot: Cultural Transmission, Marriage, and the Evolution of Ethnic and Religious Traits", *Quarterly Journal of Economics*, $955-988$.

[15] Bisin, A., Verdier, T., (2001), "The Economics of Cultural Transmission and the Dynamics of Preferences", *Journal of Economic Theory*, 97, $298-319$.

[16] Bobitt-Zeher, D., (2007), "The Gender Income Gap and the Role of Education", *Sociology of Education*, 80, $1-22$

[17] Boudon, R. (1974) *Education, opportunity and social equality*, New York, Wiley.

[18] Boudarbat, B. and Montmarquette, C. (2007), "Choice of Fields of Study of Canadian University Graduates: The Role of Gender and their Parents Education", *IZA DP*, No. 2552

[19] Bourdieu, P. (1984) *Distinction: A Social Critique of the Judgement of Taste*, London, Routledge.

[20] Bourdieu, P. and Passeron, J.C.(1964) *Les Heritiers*, Paris, Editions de Minuit.

[21] Bratti, M. (2006), "Social Class and Undergraduate Degree Subject in the UK", *IZA DP*, No. 1979.

[22] Breen, R. (2005), "Explaining Cross-national Variation in Youth Unemployment –Market and Institutional Factors", *European Sociological Review*, 21(2), $125-34$

[23] Cahuc, P. and Fontaine,F., (2002), "On the efficiency of job search with social networks, *CEPR Discussion Paper* No. 3511.

[24] Checchi, D., (2006), *The Economics of Education: Human Capital, Family Background and Inequality*, Cambridge University Press

[25] Chevalier,A (2001), "Just like daddy: the occupation choice of UK graduates", mimeo London School of Economics

[26] Cole, H., Mailath, G., Postlewaite, A. (1992) "Social norms, savings behaviour and growth", *Journal of Political Economy,* 100, 1092-1125.

[27] Corneo, G., Jeanne, O. (1998) "Social organization, status and savings behaviour", *Journal of Public Economics,* 70, 37-51.

[28] Corneo, G., Jeanne, O. (2006) "A theory of tolerance', *CEPR Discussion Paper Series* No. 590

[29] Corneo, G., Jeanne, O. (2007) "Symbolic Values, Occupational Choice and Economic Development', *IZA DP*, No. 2763

[30] Cowan, R., Jonard, N. (2007) "Merit, approbation and the evolution of social structure, *Journal of Economic Behaviour and Organization*, forthcoming.

[31] Davies, S. and Guppy, N. (1997), "Fields of study, college selectivity, and student inequalities in higher education, *Social Forces*, 75.

[32] Deaux, K.. (1996), "Social Identification", in E.T. Higgins and A. Kruglanski (eds.), Social Psychology: Handbook of Basic Principles, The Guilford Press, New York.

[33] Doepke, M., Zilibotti, F. (2007), "Occupational choice and the Spirit of Capitalism', mimeo.

[34] Easterlin, R. (1974), "Does Economic Growth Improve the Human Lot? in Paul A. David and Melvin W. Reder, (eds.), Nations and households in economic growth: Essays in honor of Moses Abramowitz. New York: Academic Press.

[35] European Commission (2004), *Europe needs more scientists. Increasing human resources for science and technology in Europe*, Luxemburg, European Commission.

[36] Fershtman, C., and Weiss, Y. (1993), "Social Status, Culture and Economic Performance", *Economic Journal*, 103, pp. 946-959.

[37] Fershtman, C., Murphy, K., Weiss, Y., (1996), "Social status, education, and growth, *Journal of Political Economy*, 106, 108-132

[38] Fershtman, C., and Weiss, Y. (1998), "Social rewards, externalities and stable preferences", textitJournal of Public Economics, 70, 53-73

[39] Fontaine, F., (2005), "Why are similar workers paid differently? The role of social networks, *IZA Discussion Paper*, No. 1786.

[40] Fontaine, F., (2006), "A structural job search model with social networks. The better match hypothesis, Universite Strasbourg 3, mimeo.

[41] Frank, R. (1985), *Choosing the Right Pond.* Oxford University Press, New York.

[42] Frey, B. and Stutzer, A. (2002), "What Can Economists Learn from Happiness Research?", *Journal of Economic Literature*, 15, 402-435.

[43] Gallart, M. A. (2006), *La escuela técnica industrial en Argentina*,, CINTERFOR/OIT, Montevideo.

[44] Galor, O. and Michalopoulos, S. (2006),"The evolution of entrepreneurial spirit and the process of development, *CEPR Discussion Paper Series*, No. 6022.

[45] Gann, J. (2001), "Hey Brother can you spare a kidney?, University of Toulouse, MPSE, mimeo.

[46] Glazer, A. and Konrad, K.A. (1996): "A Signaling Explanation for Charity, *American Economic Review*, 86(4), 1019-28

[47] Hansen, M.N., (2001), "Education and Economic Rewards. Variations by Social-Class origin and Income Measures", *European Sociological Review*, 17(3), 209 − 31.

[48] Humlum, M. K., Kleinjans, K. J., Nielsen, H.S., (2007), "An Economic Analysis of Identity and Career Choice", IZA DP No. 3120.

[49] Inglehart, R. and Baker, W., (2000), "Modernization, Cultural Change, and the Persistence of Traditional Values, *American Sociological Review* 65, pp. 19 − 51.

[50] Ireland, N. (1998), "Status-seeking, income taxation and efficiency, *Journal of Public Economics*, 70, 99 − 113.

[51] Klubitschko, D., (1980), "El origen social de los estudiantes de la Universidad de Buenos Aires, ECLAC Document.

[52] Laband, D. N. and Lentz, B. F. (1983), "Like Father, like Son: Toward an Economic Theory of Occupational Following, *Southern Economic Journal*, 10, 2, 182 − 201.

[53] Laband, D. N. and Lentz, B. F. (1992), "Self Recruitment in the Legal Profession, *Journal of Labor Economics*, 50, 2, 474 − 493.

[54] Lentz, B.F. and Laband, D. N., (1989)"Why So Many Children of Doctors Become Doctors. Nepotism vs. Human Capital Transfers", *The Journal of Human Resources*, 24(3), 396 − 413

[55] Lentz, B.F. and Laband, D. N., (1990), "Entrepreneurial Success and Occupational Inheritance among Proprietors", *The Canadian Journal of Economics / Revue canadienne d'Economique*, Vol. 23, No. 3, 563 − 579

[56] Lindbeck, A., Nyberg, S. and Weibull, J. (1999), "Social Norms and Economic Incentives in the Welfare State, *Quarterly Journal of Economics*, 114, 1 − 35.

[57] López, A. (2006), "Empresarios, instituciones y desarrollo econmico: el caso argentino, CEPAL Oficina Buenos Aires, Serie Documentos de Trabajo, LC/BUE/L.208

[58] Mailath, G. and Postlewaite, P. (2003), "The Social Context of Economic Decisions, *Journal of the European Economic Association*, 1(2-3), 354−362.

[59] Mani, A. and Mullin, C. H., (2004), "Choosing the Right Pond: Social Approval and Occupational Choice, *Journal of Labor Economics*, 22, 835 − 861.

[60] Marini, M. M. and Fan, P.-L., (1997), "The Gender Gap in Earnings at Career Entry", *American Sociological Review*, 62(4), 588 − 604

[61] Marshall, A., (1920),*Principles of Economics*,Eighth edition. London, MacMillan.

[62] Ministerio de Educación (2008), *Relevamiento Anual DINICIE*, Buenos Aires.

[63] Montmarquette, C., Cannings, K. and Mahseredjian, S. (2002), "How do young people choose college majors?", *Economics of Education Review*, 21: 543 − 556.

[64] Murphy, K., Shleifer. A., and Vishny, R., (1991), "The Allocation of Talent: Implication for Growth, *Quarterly Journal of Economics*, 106, 503 − 30.

[65] Nuñez, I. and Livanos, I., (forthcoming), "Higher Education and unemployment in Europe: an analysis of the academic subject and national effects", *Higher Education*.

[66] Oosterbeek, H. and Webbink, D. (1997), "Is there a hidden technical potential?", *De Economist*, 145: 159 − 177.

[67] Paul, J.-J. and Murdoch, P. (2007), "Study Contents and Process, Competences Upon Graduation and Employment", in U. Teichler (ed.) *Careers of University Graduates: Views and Experiences in Comparative Perspectives"*, pp. 41 − 54, Dordrecht, Springer.

[68] Piketty, T. (1998), "Self-fulfilling beliefs about social status, *Journal of Public Economics*, 70, 1, 115 − 132.

[69] Polino, C. (2008). "La ciencia como profesión. La perspectiva de la población de grandes centros urbanos en Iberoamérica", RICYT, mimeo.

[70] ProsperAr (2008), "Investment Opportunities in Software & IT Services". Available on: *www.prosperar.gov.ar*.

[71] RAND Corporation (2004), *Is the Federal Government Facing a Shortage of Scientific and Technical Personnel?*, Santa Monica.

[72] Reimer, D. and Steinmetz,S., (2007), "Gender Differentiation in Higher Education: Educational Specialization and Labour Market Risks in Spain and Germany", *Mannheimer Zentrum fur Europaische Sozialforschung Working Paper*, 99.

[73] Reimer, D., Noelke, C. and Kucel, A., (2008), "Labor Market Effects of Field of Study in Comparative Perspective. An Analysis of 22 European Countries", *International Journal of Comparative Sociology*, 49 (4–5), 233− 256

[74] Riquelme, G. (ed.) (2009), *Las universidadess frente a las demandas sociales y productivas. Tomo III: Sinergia pedagógica en universidades argentinas. Articulación de la docencia, la investigación, la extensión y la transferencia con el desarrollo de los planes de estudio*, Miño y Dávila, Buenos Aires.

[75] Rochat, D. and Demeulemeester, J.-L. (2001), "Rational choice under unequal constraints: The example of Belgian higher education", *Economics of Education Review*, 20: 15 – 26.

[76] Smyth, E., (2005), "Gender Differentiation and Early Labour Market Integration across Europe", *European Societies*, 7 (3), 451 – 79.

[77] Spence, M. A. (1973), "Job market signaling, *Quarterly Journal of Economics*, 90, 225 – 243.

[78] Smith, A. (1776), *The Wealth of Nations.* Modern Library, New York, 1937.

[79] Tacsir, E., (2009a), "Elección de ocupación: factores personales y aspectos sociales" in G. Riquelme (2009) (ed.).

[80] Tacsir, E., (2009b), "Choosing a Career in Science and Technology", paper presented at the Globelics 2009 Conference, 6-8 October.

[81] U.S. Department of Education (2006), *Answering the Challenge of a Changing World. Strengthening Education for the 21st Century.*

[82] U.S. National Science Board (2004), *An Emerging and Critical Problem of the Science and Engineering Labor Force*, Arlington, Virginia

[83] van de Werfhorst, H. G. and Kraaykamp, G. (2001), "Four field-related Educational Resources and Their Impact on Labor, Consumption and Sociopolitical Orientation", *Sociology of Education*, 74(4): 296 – 317.

[84] van de Werfhorst, H. G., de Graaf, N. D. and Kraaykamp, G. (2001), "Intergenerational resemblence in eld of study in the Netherlands", *European Sociological Review*, 17: 275 – 293.

[85] van de Werfhorst, H. G. (2002), "A detailed examination of the role of education in intergenerational social-class mobility", *Social Science Information*, 41(3), 407-438.

[86] van de Werfhorst, H. G., Sullivan, A. and Cheung, S. Y., (2003), "Social class, ability and choice of subject in secondary and tertiary education in Britain", *British Educational Research Journal*, 29: 41 – 62.

[87] van der Velden, R. K. W., and Wolbers, M. H. J., (2007), "How Much Does Education Matter and Why? The Effects of Education on Socio-economic Outcomes among Schooleavers in the Netherlands", *European Sociological Review*, 23 (1), 65 – 80

[88] Veblen, T. (1899), *The Theory of the Leisure Class.* Houghton Mifflin, Boston.

[89] Weiss, Y. and Fershtman, C. (1998), "Social status and economic performance: A survey, *European Economic Review*, 42, 802 – 820.

[90] Wolbers, M. H. J., (2007), "Patterns of Labour Market Entry: A comparative Perspective on School-to-Work Transitions in 11 European Countries", *Acta Sociologica*, 50 (3), 189 − 210

A Characterization of the Universities

The University of Buenos Aires (UBA), established in 1821, is the second oldest university in Argentina and the biggest institution in terms of students and graduates, presenting the most wide academic offer at the undergraduate and postgraduate levels. Its research production outnumbers any other university in the country. Universidad Nacional de Misiones (UNAM) and Universidad Nacional de Mar del Plata (UNMdP) were founded in the early seventies as part of new wave of institution creation. In the first case, the university was established over some existing institutes. In the case of Mar del Plata resulted from the merger of two different universities: one originally provincially funded and a private institution.

By 2005, the 3 surveyed universities accounted for more than 62,000 students, 18.6% of the university students in Argentina (Table 13). As is the case with the system as a whole, the biggest group of students in these 3 universities are those enrolled in social sciences, closely followed by those in applied sciences. Again, the students in priority fields are a small group inside the institutions but representative of the population in these fields at the national level.

	New enrollments		
Field	Surveyed universities	Total system	Share (%)
Applied Sciences	16,292	70,541	23.1
Basic Sciences	1,701	11,899	16.3
Health Sciences	12,061	54,617	22.1
Humanities	8,772	59,654	14.7
Social Sciences	23,277	137,233	17.0
Total	62,103	333,944	18.6
Non priority	55,214	292,064	16.8
Priority	6,889	41,880	18.9

Table 13: Number of new enrollments by field of science in the universities surveyed and the total university system and share in relation to the total system for 2005. Source: Author's elaboration based on University Statistics Yearbook, 2006.

The small graduation rate is another characteristic of the Argentine university system. Bordering 25%, this level is extremely low relatively to international standards. Again, the universities considered here are representative of this feature. With an average rate of graduates in relation to new enrollments of 30%,

the priority fields are slightly over 22% while non-priority fields reach 31%. (Table 14). An important factor in relation to the low graduation rate is that the admission to universities in most of the cases only requires the student to only have finished high school. This is the case in the three universities under study.

Disciplines	New enrollments (%)	Graduates (%)	Graduates/ New Enrollments (%)
Applied Sciences	26.2	17.4	19.9
Basic Sciences	2.7	3.1	34.5
Health Sciences	19.4	13.1	20.3
Humanities	14.1	11.4	24.1
Social Sciences	37.5	55.0	44.1
Non priority	88.9	91.7	31.0
Priority	11.1	8.3	22.1

Table 14: Distribution of new enrollments and graduates and proportion of graduates in relation to new enrollments by discipline for the three surveyed universities for 2005.On percentages. Source: Author's elaboration based on University Statistics Yearbook, 2006.

In relation to its geographical location, UBA is located in the metropolitan area of Buenos Aires, being the city of Buenos Aires and its important suburbs population from which it draws the majority of its students. This geographical area concentrates 31.6% of the total population of the country and an important fraction of the economic activity. With the intention of diversifying and widening the existing higher education market, 7 new public universities were set in the suburbs of Buenos Aires in the nineties. However, UBA retains its importance, the other ten public universities that co-exist in this area being confined to serve small populations in specific locations. UNMdP is located in the coastal region of the country, in a district that was populated by something more than 500,000 people (1.4% of the country's population), showing growth rates below both the provincial and national figures. Contributing with 1.3% of the national GDP, the regional economy is oriented mainly towards services and commerce (specially tourism), being important other activities such as fisheries and textile industry. Finally, UNAM is placed on the northeaster region of the country. The province of Misiones accounts for 2.7% of the total population, exhibiting an important proportion of rural population (30%, three times the national average). With an economic activity that contributes slightly over 1% of the national GDP, forestry, wood and paper production and food and beverages industries –such as tea and mate[36].

The aforementioned factors influence the academic offer in each institution. As Table 15 shows, UBA has the most extensive and diverse offer of the three

[36]Mate is a traditional South American infused drink, prepared from steeping dried leaves of yerba mate (*llex paraguariensis*) in hot water.

universities. Its offer reaches each field and almost the whole universe of disciplines, almost doubling that by the other two institutions.

	Number of degrees		
Field of science	UBA	UNMdP	UNAM
Applied Sciences	42	16	21
Basic Sciences	10	8	7
Health Sciences	17	5	2
Humanities	11	9	2
Social Sciences	24	12	15
Total	104	50	55

Table 15: Number of undergraduate degrees offered by the surveyed universities at 2005. Source: Riquelme (ed.), 2008.

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